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(בעברית) (Hebrew) בקרת מגבר דמות

(באנגלית) (English) CONTROL OF IMAGE INTENSIFIER

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CONTROL OF IMAGE INTENSIFIER

בקרת מגבר דמות

Eitan, Pearl, Latzer & Cohen-Zedek

P-5522-IL

Control of Image Intensifier

Field of the Invention

The present invention relates to the field of Image Intensifiers and their control systems in general, and to methods and means for reducing the common phenomena of "glare" or "bloom" inherent in Image Intensifiers.

Background of the Invention

An image intensifier is an electronic device that produces a radiation pattern electrically amplifies an image focused on the photosensitive surface of photo cathode and presents the amplified image on a fluorescent screen at the output .One wide spread major application of Image Intensifiers is its use in night vision devices serving the military as well as other law enforcing agencies. Under very low illumination conditions, an image intensifier is capable of collecting and exploiting the low count of photons available in the environment and intensifying their image by factors of 50,000 to 100,000 times, providing good observation conditions in otherwise dark, barely illuminated neighborhoods.

However, image intensifying technologies are susceptible to harmful "glare" or "bloom" phenomena. Due to the fact that the entire field of view (herein after FOV) is intensified uniformly, a locally brightly bright illuminated source can "blind" the system, causing and may even cause permanent damage to the system; Image intensifier. The damage is caused by the light of the bright sources when intensified by approximately hundred thousands factor. It is focused on the photo cathode.

To prevent occurrence of such potential damage, the gain of the image intensifier is decreased or the gating (exposure) time is shortened. Employing said reduction techniques; it is possible to protect the tube – albeit by doing so we evidently reduce the brightness of the entire image – potentially resulting in

deterioration of the user's night surveillance performance. Note that providing protection from over bright sources by gating the number of collected incident photons that would be amplified, or automatic brightness control that reduces the power of intensification, are applied uniformly to all the field of view and thus the overall performance deteriorates due to lowering the sensitivity and the contrast qualities of the system image. Moreover, bright light sources create an additional interference due to the intensification processed image – namely the appearance of a halo around the displays of the bright areas.

The implementation of a micro mirror array coupled to associated optics in order to control the intensity of the "intensification processed" light displaying the image is described in patent US 6,069,352. A control circuit determines whether a pixel's intensity is above or below a preset threshold level. In case it is above it, the corresponding elements of the micro mirror's array will deflect the incident light at that specific area, thereby eliminating saturation of the image intensifier from those pixels. Namely - the remainder of the image is unchanged and used for continued viewing. A continuous feedback loop monitors the intensity level of the pixels and actively controls the incident light governed by the micro mirror array.

The technology described in above cited US patent employs a Micro Mirror Array (referred to as "MMA" in the terminology of that patent) for its operation. This device is also known in the field by the acronym DMD (Digital Micro Mirror Device) and appears in the literature also as MEMS (Micro Electro Mechanical System), as well as MOEMS (Micro Opto Electro Mechanical Systems) and of late also as "reflective spatial light modulator mirrors" – herein after: reflective MEMS.

Such reflective MEMS's can be commercially purchased of the shelf, for example from Texas Instruments, Inc. In the application as described in the above mentioned documented patent for using the reflective MEMS, there is a built in drawback: moving (shifting) one or more reflective MEMS mirror/s of the micro mirrors array, requires a given duration (time). We are referring to the elapsed time associated with the rotation of the mirror around a hinge, a

movement that calls for an appropriate response (reaction) time which is the time it takes until the unwanted glare is deflected from the Image Intensifier's input plane – unto which the reflective mirror was reflecting initially. Naturally, the movement, which lasts for some time, generates a "smearing" of the glare's light over substantial portion of Image Intensifier's input plane. This "smearing" is enhanced by the Image Intensifier itself, as long as the glare of the light keeps impinging on the image intensifier entrance plane, that is, until it will be totally deflected away from the entrance plane.

Another known practice is implemented by a technology known and recognized as "the flipping pixel", which is bi-stable at 0° – 180° or 0° – 90°. It enables forming an array of mechanical nano – optical shutters that allow a fast control of whatever part of the area of a target that will receive the desired signal radiation and of the area that would not receive it and this subject to high spatial resolutions. A shutter array comprises a matrix of optical shutters positioned between a radiant source and a target. Every one of the shutters in the matrix is endowed by an "ON" state that allows light to pass through it and arrive at the target, and an "OFF" state that blocks the light from the source and prevents it from impinging on the target.

This referred to "other technology" is also known as "Micro Electro Mechanical Systems" (MEMS's) and also as "Micro Opto Electro Mechanical System" (MOEMS) transmissive spatial light micros (hereinafter: "transmissive MEMS"). Such a technology is described, per instance, in the article "Bi –stable Flat Panel Display Based on a 180° or preferred 0° – 90° Flipping Pixel" by Flixel Ltd. Company (at its site: WWW.flixel.com).

Summary of the Invention

The proposed innovation disclosed in the present invention enables to control the amount of light that enters the input tube of an image intensifier from a specific observed area. The capability to control the amount of light entering the Image Intensifier enables to achieve optimal operation conditions of operating at maximum gain or exposure periods even when bright sources are located inside the FOV, and this with resizable degrading the quality of the overall scene image.

These beneficial capabilities are achieved by the technology of present invention, by interlacing a means that regulates the "quantity of light" entering the image intensifier, in accordance with specific areas of intense bright light which the new means manages to detect using a control and feedback circuit devise.

In accordance with the present invention, the light regulating means might be, preferably, a transmissive MEMS component (and not only a reflective MEMS component) – that is positioned in the optical focus plane of the arena being the subject of surveillance or observation, and inserted before the photo sensitive area of the image intensifier – in accordance with the specific configuration of implementing the invention.

The added means that regulates the light, namely the control and feedback circuit, includes – as previously, the cited image sensor that detects intensely bright light areas, and in addition an image processing means that relates the intensely bright light areas that were detected using the image sensor, to the respective areas of the light regulating means, in a manner that enables selective operation of the light regulating means in said intensely bright light areas in order to influence the image being received by the image intensifier.

In the mentioned earlier known configuration of applying a reflective MEMS component, the present invention upgrades it by having the control and

feedback circuit operate the image intensifier in a “gating mode”, thus managing to time the light intensifying provided by the image intensifier to the specific time slot after deflecting the light rays emanating from the intensely bright light areas away from the input plane of the image intensifier was essentially completed.

In another preferred configuration of the present invention, the image intensifier is endowed with the capability of operating in a gating mode. The system is integrated into a surveillance system that is based on gating imaging, with or without an auxiliary source of light that illuminates the target (for example, a laser beam source), for obtaining timed light reflections from the target.

Brief Description of the Drawings

The present invention will be more fully understood and appreciated by noting the following detailed description, taken in conjunction with the drawings, in which:

Drawing No. 1 is a schematic illustration of a passive night sighting system, wherein one configuration of the present invention is embodied, namely regulating the light that enters specific areas of the image intensifier by employing a light regulating means of the reflective MEMS type, where in addition, the control and feedback circuit device is simultaneously actuating the image intensifier in a gating mode, timing the light intensification provided by the image intensifier to the time slot after deflecting the light rays emanating from the intensely bright light areas away from the input plane of the image intensifier was essentially completed.

Drawing No. 2 is a schematic illustration of a passive night viewing system, wherein a second configuration of the present invention is embodied, namely regulating the light that enters specific areas of the image intensifier by employing a light regulating means of the transmissive MEMS type component.

Drawing No. 3 is yet another schematic illustration of a passive night sighting system, the one illustrated in Drawing No. 2, wherein the transmissive MEMS type component is positioned as an integral part inside the image intensifier – at its input plane area.

Drawing No. 4 is yet an additional schematic illustration of another version of a passive night viewing system, the one illustrated in Drawing No. 2, wherein the control and feedback circuit means is based on an image sensor that is embodied by a CCD/CMOS camera and that is positioned at the output focal plane of the image intensifier area.

Drawing No. 5 is one more presentation of a schematic illustration of an additional version of the passive night viewing system presented by Drawing No.

4, wherein the transmissive MEMS type component is positioned as an integral part inside the image intensifier – at its input plane area.

Drawing No. 6 is a schematic illustration of a passive night viewing system, wherein a third configuration of the present invention is embodied, namely regulating the light that enters specific areas of the image intensifier, by employing a light regulating means of the reflective MEMS type component, where in addition the light undergoes polarization, and wherein the control and feedback circuit is operating the image intensifier in a gating mode, for timing the light intensification provided by the image intensifier to the time slot after deflecting the light rays emanating from the intensely bright light areas away from the input plane of the image intensifier was completed.

Drawing No. 7 is a presentation of a schematic illustration of an additional version of the passive night viewing system presented in Drawing No. 1, wherein the received light beam is folded at its direction by 180°.

Drawing No. 8 is a schematic illustration of combining a system for controlling light amenable to be intensified by an image intensifier in accordance with the present invention, with a planar optics technology, such that a display of the intensified image in planar packaging mode is enabled, to be viewed jointly by both the eye of an observer and a camera focused to it.

Detailed Description of the Drawings

Referring to drawing No. 1. , The drawing is a schematic illustration of a passive night viewing 10. In this system 10, a reflective MEMS type component 30 performs the regulation of light that enters the image intensifier 20.

Photons 35 that are reflected from the surrounding environment to the objective lens 40, are not received directly by the image intensifier 20 but rather directed first through an intermediate route to impinge on tilt mirror 45 by it towards spatial light modulators 50, located at the focal plane of image intensifier 20 and implemented by reflective MEMS made of an array of micro mirrors 55.

The micro mirrors 55 control the number of photons entering different selected areas of image intensifier 20 in a known way that is described for example in patent US 6,069,352 – the contents of which is hereby incorporated by reference.

Through lens 60, image intensifiers 20 receive the photons being reflected from mirrors 55.

The intensified light 65 following its path through image intensifier 20 is directed towards a splitter component 70. This splitter component 70 splits the intensified image and projects it in parallel towards two directions. In one direction it is aimed at the viewer's system 75 (in the illustrated example, this is the human observer's eye), whereas the second beam is directed towards image sensor 80, which might be for example a CCD camera or a CMOS device. Note also that the illustrated person's eye 75 can be replaced by a display screen or by means to transfer the image onwards, say to a remote viewing implement.

Image sensor 80 constitutes the first component of the control and feedback circuit means 85 that operates –in a selective manner – the reflective MEMS mirrors 55. Image sensor 80 receives the intensified image and detects intense bright light sources in the arena under surveillance.

Image processor 90 is connected to image sensor 80 and performs analysis of the image received by image sensor 80. A light source whose intensity is higher than a selected preset threshold value will be defined as "a source of intense bright light" for the sake of treatment by the system. The analysis designates the specific area/s; one or more, in which intensely bright light sources were detected that appear in the image received by image sensor 80, applying them to the relevant sectors in the reflective MEMS mirrors 55 array.

In other words - the detection of sources of intense bright light at a specific spatial position over the image that was received by the image sensor 80, necessarily indicates a reflective projection that arrived from the mirror/s, one or more, whose specific location/s is/are also specific and known. This one to one correspondence assignment of the location of the point causing the "glare" or "bloom" and the specific mirror or group of mirrors, enables the desired selective operation of mirrors 55 through the control and feedback circuit component 95. For example, it is possible to limit the routing of the light from that specific mirror or group of mirrors for a selected defined time slot, so that the image received at the viewer's system 75 shall not be degraded nor be subjected to "glare" or "bloom" emitting from that region.

An essential feature that characterizes the present invention in regard to the reflective MEMS based configuration illustrated in Drawing No. 1, namely the configuration in which the light regulating means is of the reflective MEMS 30 type component, is in the arrangement by which the control and feedback circuit means 95 operates in addition (97), image intensifier 20 in the desired gating mode.

Operating the image intensifier 20 in the gating mode is conducted in order to achieve correct timing of the light intensification by image intensifier 20 to coincide with the time slot that was essentially completed, of deflecting the light rays emanating from the intensely bright light areas away from the input plane of the image intensifier. If, say, intense light regions would have been

detected, namely entities that would have caused glare and degrade the quality of the image or even cause damage to the intensifier tube, the image processor 90 would have shut down the image intensifier 20 for a definite period of time that is essentially equal to the time that would have been necessary for deflecting one or more reflective mirror/s of the micro mirrors array 55, i. e., move them away from the state of routing the beam to the input opening plane of the image intensifier to a state of routing the beam to a far away direction (e. g., to a light trap – not shown in the illustration).

To recapitulate – the above discussion relates to switching the image intensifier for a temporary duration to a switched off (i. e., shut down) condition, this time being equal to the time duration that would have been required for the rotation of the mirror around a hinge, a movement that call for a relatively long reaction and operation time, a continuous action that would last until the glare of the light is deflected from the input plane region of the image intensifier 20, unto which the reflective mirror was pointed in the beginning.

In this manner, the reception of a "smearing" glaring light over the input plane region of the image intensifier 20 is prevented, and as derived from it, the smearing radiation is not intensified by the neutralized (shut down) image intensifier 20, as long as the intense bright light causing glare was not deflected away and driven entirely out of bounds from the input plane region of the image intensifier 20.

The image processor 90 switches the image intensifier 20 back to its normal intensifying state, after the said short period (approximately 10 milliseconds) terminates, namely the time required for the reflective MEMS 30 to vary the position of its micro mirror/s (one or more), in the zones in which light beams emanating from the intense bright light regions are impinging (which are the beams causing the bright zones in the intensified image).

Any professional in this field would understand, that image intensifier 20 might also have an additional gating capability (and not only for shutting down its operation during the time slot in which the mirrors are moving in the reflective MEMS component). The system might be, for example, a part of an observation

and surveillance system that is based on gated imaging with or without an auxiliary illuminating source that illuminates a target (for example, a laser beam source), for receiving timed light reflections from the illuminated target.

Let's refer now to Drawing No. 2. Drawing No. 2 is a schematic illustration of a passive night viewing system 210, wherein a second configuration of the present invention is embodied, namely regulating the light that enters specific areas of the image intensifier 220 by employing a light regulating device of the transmissive MEMS type component 230.

In the specific configuration illustrated in this drawing, the image sensor 280 component is located substantially parallel to the line of sight (LOS) of the image intensifier 220 and receives, in an independent mode, light reflections from the area being observed. Any professional in this field would understand that in this parallel configuration, the need for a splitter does no longer exist (see splitter 70 in drawing No. 1). Concurrently, any professional in this field would understand, that it is possible to locate the intensely bright light sources in the arena being observed, also by employing a control and feedback circuit means in which the image sensor receives the image from a splitter at the output the image intensifier (in a similar fashion to that illustrated in drawing No. 1) in a configuration in which the image sensor does not independently observe the field of view.

In accordance with the present invention, photons 235 that are reflected from the surrounding environment to the objective lens 240 are not received directly by the image intensifier 220 but rather pass first through a transmissive MEMS 230.

An outstanding advantage gained by using the transmissive MEMS rather than the reflective MEMS, is the result of its (the transmissive MEMS) short response reaction time (approximately 1 μs as compared to the 10 μs inherent with reflective MEMS configuration).

An additional fact to be noted is that operating the transmissive MEMS does not involve "passing" and "smearing" of the light beams whose arrival at the said input plane of the image intensifier one wishes to prevent. See the

innovative approach of the present invention for solving this problem, by referring to the configuration illustrated in drawing No. 1.

Image intensifier 220 receives the photons passing through transmissive MEMS 230 and lens 260. Once again, any professional in this field would understand, that image intensifier 220 may have the gating capability with or without an auxiliary source that illuminates the target (for example, a laser beam source), for obtaining timed light reflections from the selected target.

The intensified light arriving from the image intensifier 220 projects the image unto the viewer's system 275 (in the illustrated example – a person's eye).

Image sensor 280 (for example, a CCD camera or a CMOS device) constitutes the first component of the control and feedback circuit means 285 that selectively operates the transmissive MEMS 230. Image sensor 280 – in the current configuration (see drawing No. 2) is independently viewing the same field of view that is concurrently observed by image intensifier 220. Image sensor 280 detects intensely bright light sources located within its field of view. Image processor 290 is connected to Image sensor 280 and performs an analysis of the image received by image sensor 280. In accordance with the stipulations of the present invention, the analysis relates the specific area/s, one or more, in which intensely bright light sources were detected within the sector under observation, with the respective sectors in the transmissive MEMS 220 array.

In other words, detecting an intensely bright light point at a specific location of the image received by image sensor 280, of necessity points at and shows that light was in addition transferred in parallel – also through one or more specific passages in the transmissive MEMS 230, whose positions are also specific and recognized. This one to one corresponding relation between the location of the glare source in the image that was observed by the image sensor 280, to the specific passage or group of specific passages through the transmissive MEMS 230, enables selective operation of the transmissive MEMS 230. Selective operation which is implemented by the control feedback 295. For

example, it is possible to limit the passage of light from that given passage or group of passages for a certain selected duration of time, so that the image being received at the viewer's viewing system 275, shall not be impaired by glaring light from that same area.

Referring to Drawing No. 3, Drawing No. 3 is a schematic illustration of an additional version 310 of the passive night sighting system which is illustrated in Drawing No. 2, wherein the transmissive MEMS type component is positioned as an integral part inside the image intensifier 320 – at its input plane area 322 (implemented on its photo sensitive surface area).

Let's refer now to Drawing No. 4. Drawing No. 4 is a schematic illustration of yet another version (denoted 410) of a passive night viewing system, the one illustrated in Drawing No. 2, wherein the control and feedback circuit means, is based on an image sensor 480 intensifier that is embodied by a CCD/CMOS camera and that is part of an ICCD type image intensifier 420.

As is the case with the configuration drawn in drawing No. 2, a transmissive MEMS 430 is used to regulate the amount of light enter the image intensifier 420. An image sensor 480, is attached to the image intensifier screen, captures the image and converts it to video format. An image processing circuit analyses the image controls the transmissive MEMS.

Reference is being made to drawing No 5, Drawing No. 5 is a schematic illustration of an additional version, version 510 of the passive night viewing system illustrated in Drawing No. 4, wherein the transmissive MEMS type component 530 is positioned as an integral part inside the image intensifier 520 – at its input plane area (implemented on its photo sensitive surface area).

Let's refer now to drawing No 6. Drawing No. 6 is a schematic illustration of a passive night viewing system 610, wherein a third configuration of the present invention is embodied, namely regulating the light that enters specific areas of the image intensifier 620, by employing a light regulating device of the reflective MEMS type component 630, and where in addition the light undergoes polarization (in order to reduce losses), and wherein the control and feedback circuit device 685 operates in addition (697) the image intensifier 620 in a gating

mode, for timing the light intensification provided by the image intensifier 620 to fit the time slot after deflecting of the light rays emanating from the intensely bright light areas away from the input plane of the image intensifier 620 is substantially completed (moving of the reflective MEMS 630 mirrors).

The light reflected (635) from the sector being observed is routed via lens 640 to beam splitter 645. The beam of light rays is directed from beam splitter 645 towards the light regulating means, which is implemented by the reflective MEMS 630. The beam of light rays is reflected from the light regulating means 630 (in its entirety or only parts of it, depending on the sate of operation of the mirrors array), in the same plane but at a reversed (an opposing) polarity. The polarized beams pass via splitter 645 and are received upon lens 660's surface. Lens 660 focuses the beam on a reflective lens 662 that projects the light unto the input of image intensifier 620. In a similar manner to the configuration illustrated by drawing a No. 1, the intensified image 665 is routed to a splitter component 670. The splitter component 670 splits the intensified image and projects it simultaneously into two directions – in one direction to the viewer's system 675 (the person's eye in the illustrated example; another example might be a screen), and in the second direction it is projected unto the image sensor 680 (for example, a CCD camera or a CMOS device). Image sensor 680 constitutes the first component of the control and feedback circuit means 685 that also includes the image processor 690. The control and feedback circuit means 685 selectively drives the reflective MEMS 630 mirrors and switches the image intensifier to a shut down ("OFF") condition for the duration of time that is essentially equal to the time required by the reflective MEMS 630 to deflect the beams that generate the glare areas away to the outside of the image intensifier input entrance.

Note that, also regarding the configuration of system 610, any professional in this field would understand, that the image intensifier 620 might as well have an additional gating capability as aforementioned, that would enable integrating the system into a surveillance system that is based on the gating imaging principle with or without an auxiliary source that illuminates the

target (for example, a laser beam source), for obtaining timed light reflections from the selected target.

Reference is being made to Drawing No. 7 which is a presentation of a schematic illustration of an additional version 710 of the passive night viewing system presented in Drawing No. 1, wherein the received light beam 735 is folded at its direction by 180°.

Reflective MEMS 730 is positioned in 45 degrees relative relation to lens 740 and at one state of affairs, reflects the light unto lens 745 that is focused on the micro mirrors of the MEMS. An image sensor 780 is attached to the image intensifier 720 that captures the image and converts it into a video format; an image processing circuit 790 analyses the image and controls the reflective type MEMS 730.

Concurrently, the control and feedback circuit means 785 switches the image intensifier to a shut down ("OFF") condition for the duration of time that is essentially equal to the time required by the reflective MEMS 730 to deflect the beams that generate the glare areas away to the outside of the image intensifier input entrance.

In view of the foregoing discussion, it is evidently clear that any professional in this field would understand, that in systems in which the light regulating means is of the reflective MEMS type, and in addition one observed the intensified image in an un-direct manner, but rather views it using a camera, it is possible to avoid the "smearing" by switching of the camera itself rather than image intensifier.

Let's refer now to drawing No. 8. Drawing No. 8 is a schematic illustration of a combination of a system 810 for controlling light amenable to be intensified by an image intensifier in accordance with the current invention with a planar optics technology, such that a display of the intensified image in planar packaging mode is enabled, to be viewed jointly by both the eye of an observer and a camera.

A planar optics technology implements holograms' optics for the sake of simultaneously displaying an image to a person's eye and to a camera (for

example – HUD (head up display) applications). Such a technology is described, for example, in patent applications submitted in the United States of America, e. g., No. 09/647520 and No. 60/357290 submitted by the applicant of the present patent application and thus their contents is therefore incorporated by reference.

In the illustrated example, a transmissive MEMS component 830 is located upon a glass plate assembly 851. Light photons 835 are routed through an objective lens 840 towards the transmissive MEMS 830 that is located at its focal plane. The light that is transferred through transmissive MEMS 830 (in accordance with the state of operating the various areas on its surface) is intensified by image intensifier 820. The image of the intensified entity is split by the implementation of the planar optics, into the image that is observed by the viewer's means 875 (a person's eye in the illustrated example) and into an image whose picture is taken by image sensor 880 (e. g., CCD/CMOS camera).

Image sensor 880 constitutes the first component of the control and feedback circuit means 885 that includes in addition the image processor 890 and connection 895 through which the image processor 890 drives the transmissive MEMS 830 in a manner similar to the operation described above when referring to drawing No. 4.

It will be appreciated by persons who are skilled in the art, that the present invention is not limited by what has been particularly shown and described above. Rather, the scope of the present invention is only defined by the claims that follow.

Claims

1. A system for controlling light that is amenable for intensification by an Image Intensifier, and where the system includes -

means for regulating light intensity, wherein it is positioned externally to the image intensifier at the focal plane of the light to be intensified or placed internally at the focal plane of the image intensifier before the photo sensitive area of the image intensifier; and

a control and feedback circuit means that includes an image sensor, wherein said image sensor is capable to detect the zones with intensely bright light areas and is coupled with an image processing means that relates the locations of said zones with intensely bright light areas that where detected by said image sensor to the respective areas on the surface of said light regulating means, in a manner enabling selective operation of said light regulating means at those areas, so that it can operate on the image received from the image intensifier; and

the system is characterized by its configuration and functions, so that -

said light regulating means is a reflective MEMS component or a transmissive MEMS component; and

in case wherein said light regulating means is a reflective MEMS component, then said control and feedback circuit drives in addition the image intensifier to operate in a gating mode, in order to time the light intensifying action of the image intensifier to start upon the specific time slot that was essentially completed, of deflecting the light rays emanating from the intensely bright light areas away from the input plane of the image intensifier.

2. The system for controlling light that is amenable for intensification by an Image Intensifier in accordance with claim 1, and wherein -

said light regulating means is a transmissive MEMS component that is mounted as an integral part inside said image intensifier.

3. The system for controlling light that is amenable for intensification by an Image Intensifier in accordance with claim 1, and wherein -

said image sensor that detects the zones with intensely bright light areas is a CCD / CMOS camera.

4. The system for controlling light that is amenable for intensification by an Image Intensifier in accordance with claim 3, and wherein -

said camera is located so that it can record/shoot items in parallel to the line of sight of said image intensifier and receives, independently, reflected light signals from the area under surveillance.

5. The system for controlling light that is amenable for intensification by an Image Intensifier in accordance with claim 3, and wherein -

said camera is located at the output of said image intensifier in order to record / photograph the intensified image.

6. The system for controlling light that is amenable for intensification by an Image Intensifier in accordance with claim 1, and wherein -

said image sensor is a device of the ICCD type and is integrated in the image intensifier.

7. The system for controlling light that is amenable for intensification by an Image Intensifier in accordance with claim 1, and wherein -

said image intensifier is endowed with a gating capability, hence is capable of timing the light being reflected from a target that was illuminated using an auxiliary source, for receiving timed light reflection from said illuminated target.

8. A passive night viewing system, that includes -

an image intensifier equipped with a photo sensitive area upon which the image that can be intensified is projected, and at whose output the intensified image is being observed, and

the system is characterized by the additional items that it incorporates, namely -

a system for controlling light signals that can be intensified by said image intensifier, and that includes -

light regulating means positioned at the focal plane of said amenable for intensification light, at a location which is however before the photo sensitive area of said image intensifier, and

a control and feedback circuit means that includes an image sensor, and wherein said image sensor detects the intensely bright light areas and an image processing means that relates the intensely bright light areas that were detected using said image sensor, to the respective areas of the light regulating means, in a manner that enables selective operation of the light regulating means in said intensely bright light areas in order to influence the image being received at the output plane of said image intensifier, and wherein said system for controlling the light that can be intensified is characterized by the following -

said light regulating means constitutes a reflective MEMS component or a transmissive MEMS component, and wherein -

In case said light regulating means constitutes a reflective MEMS component, then said control and feedback circuit means drives, in addition, the image intensifier to operate in a gating mode, so that it times the intensification of the light by said image intensifier to suit the specific time slot that was essentially completed, of deflecting the light rays emanating from the intensely bright light areas away from the photo sensitive surface area of said image intensifier.

9. A method for controlling light that is amenable for intensification by an Image Intensifier that includes the stages of -

positioning light regulating means at the focal plane of the light that is amenable for intensification and before the photo sensitive area of the image intensifier, and

detecting the zones of intensely bright light areas in the image being received from the image intensifier, and

relating the locations of said intensely bright light areas to the respective zones of said light regulating means surface, and

conducting selective operation of said light regulating means in the above cited zones and areas, in order to influence the intensified image that is received at said image intensifier's output.

Whereas said method is characterized by that the -

light regulating means might be a reflective MEMS component or a transmissive MEMS component, and in case the light regulating means constitutes a reflective MEMS component, then the methods includes, in addition, a stage of -

operating said image intensifier in a gating mode, so that it times the intensification of the light by said image intensifier to suit the specific time slot that was essentially completed, of deflecting the light rays emanating from the intensely bright light areas away from the photo sensitive surface area of said image intensifier.

10. A system according to any of the claims 1 – 7, substantially as described herein above.

11. A system according to any of claims 1 - 7, substantially as illustrated in any of the drawings.

12. A system according to claim 8, substantially as described hereinabove.

13. A system according to claim 8, substantially as illustrated in any of the drawings.

14. A method according to claim 9, substantially as described hereinabove.

15. A method according to Claim 9, substantially as illustrated in any of the drawings.

For the Applicant

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Lawyers, Patent Attorneys & Notaries
P-5522-IL

Fig. 1

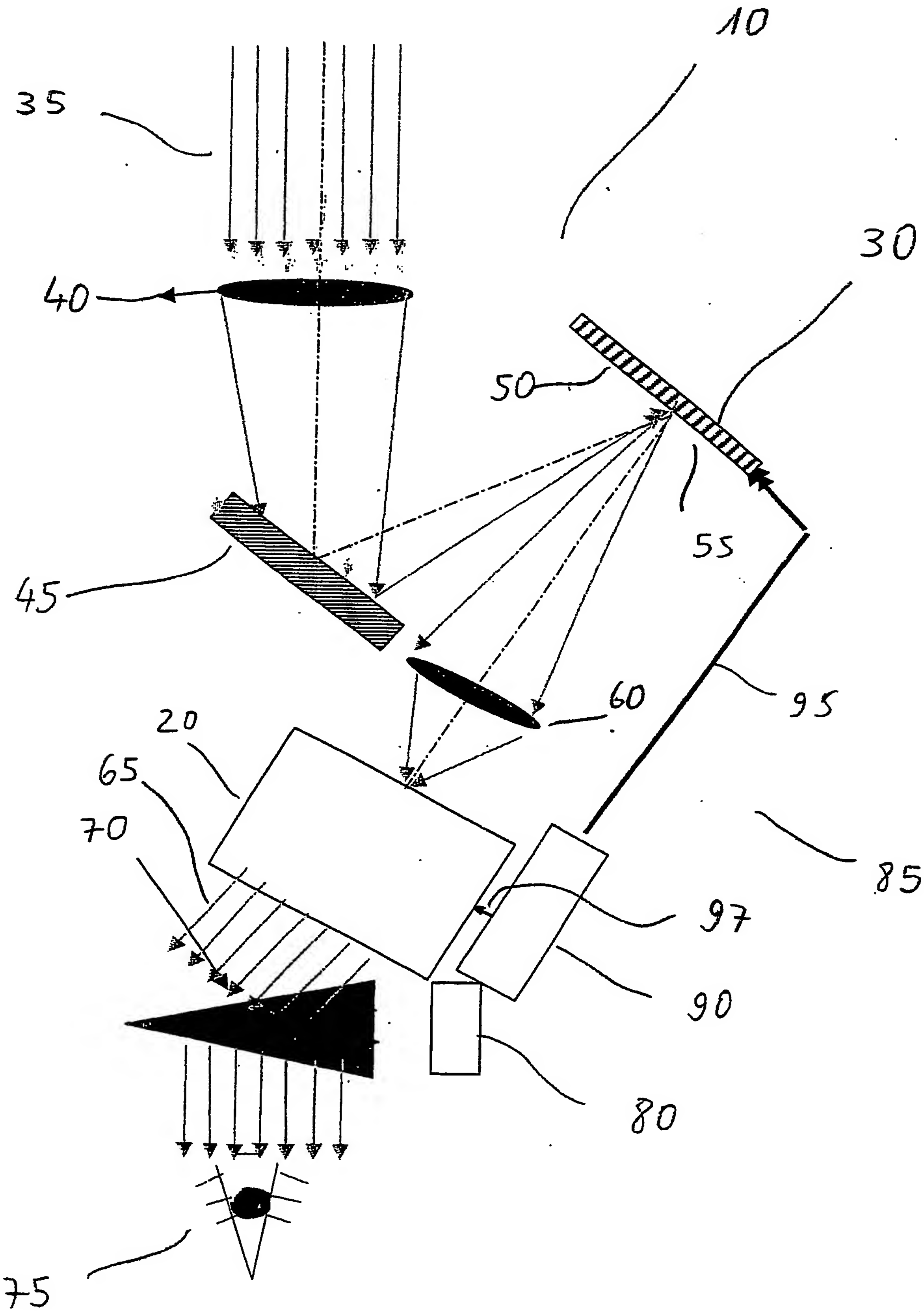

Fig. 2

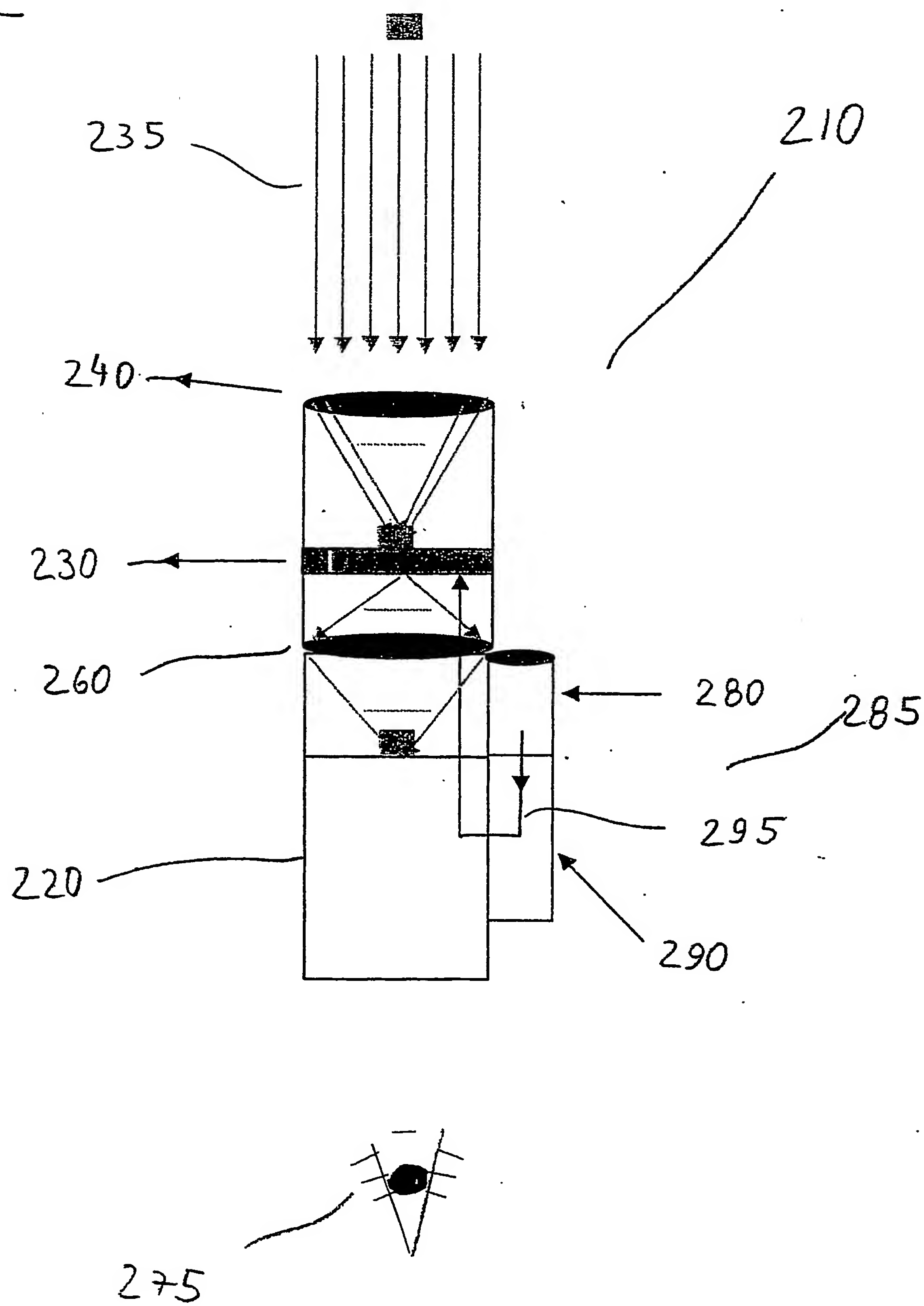

Fig. 3

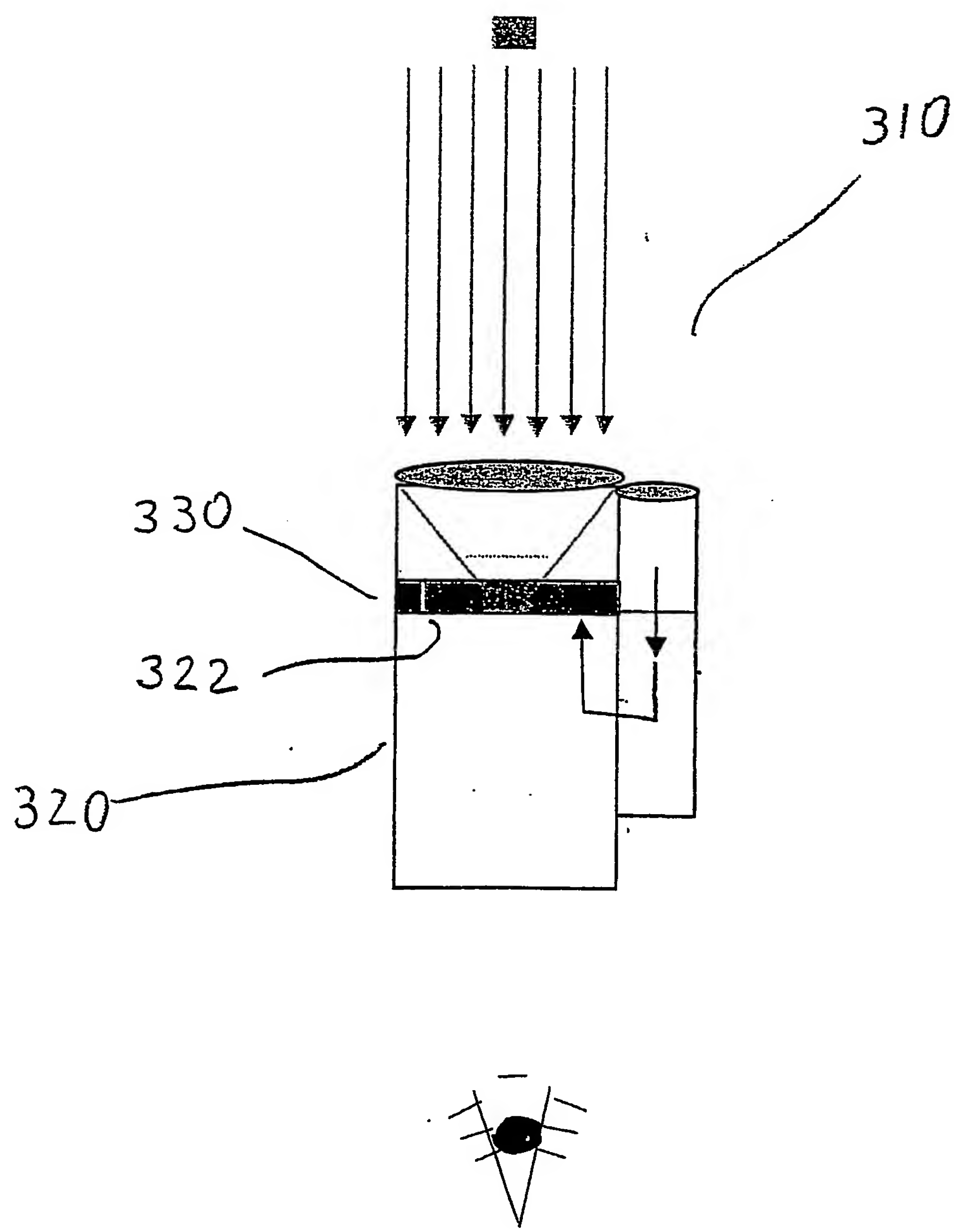

Fig. 4

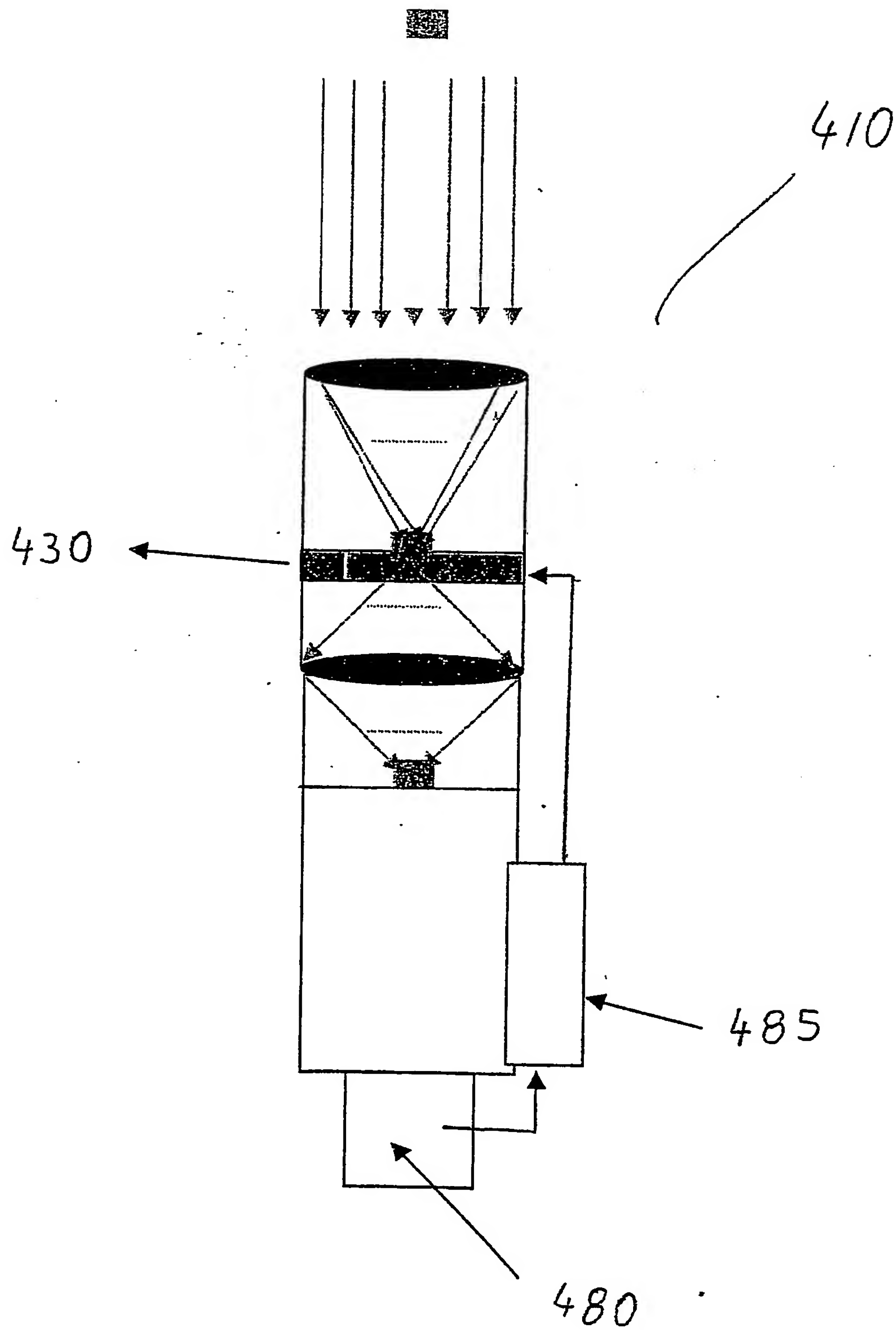

Fig. 5

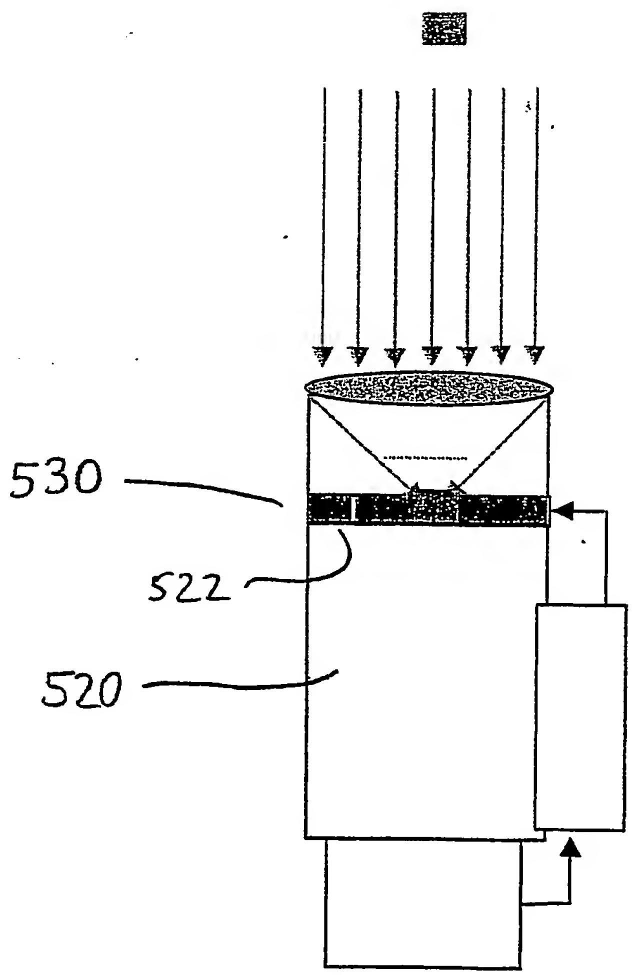

Fig. 6

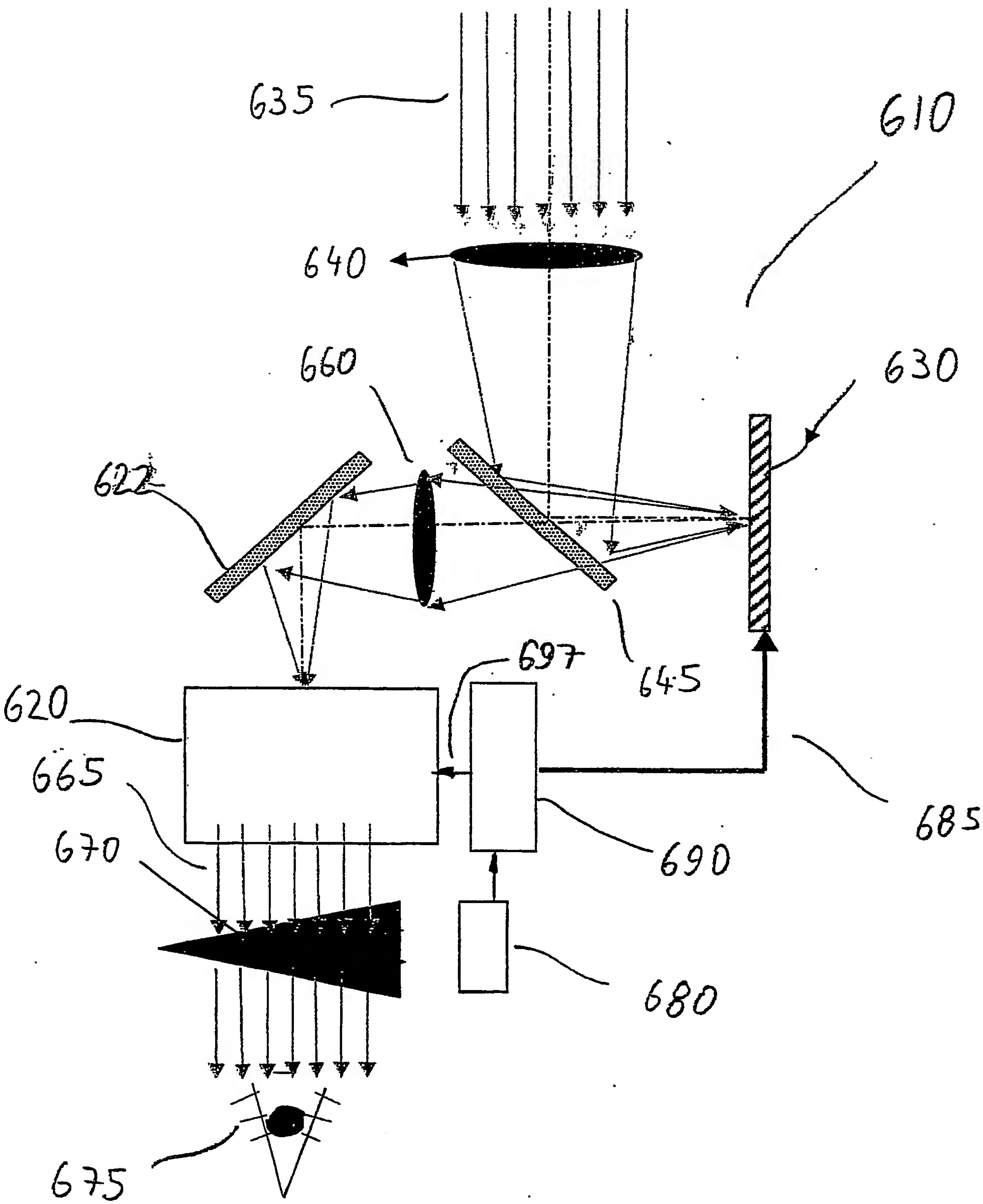

Fig. 7

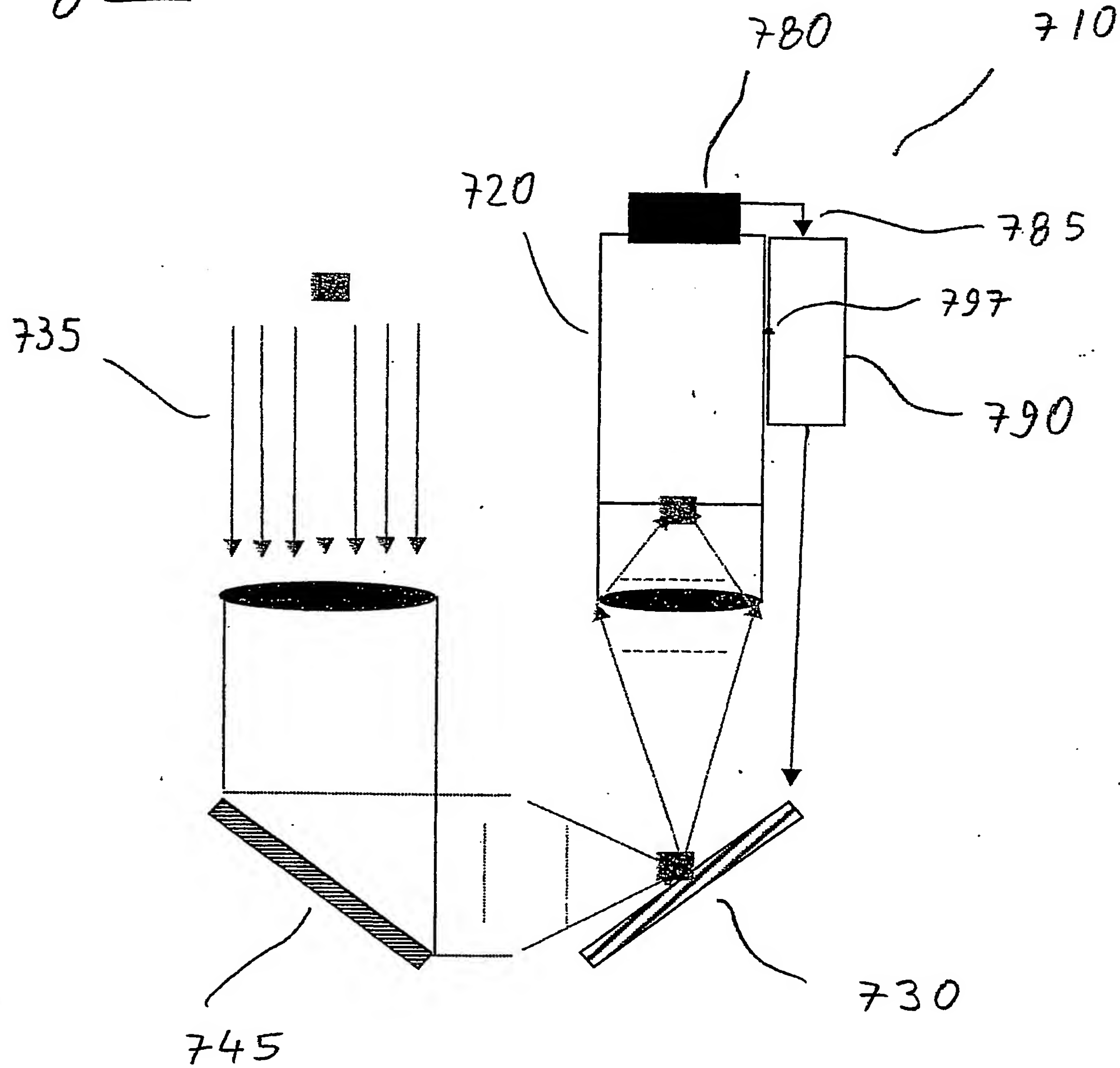

Fig. 8